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ECONOMIC INTELLIGENCE MEMORANDUM

SIGNIFICANT DEVELOPMENTS IN THE FUELS AND POWER INDUSTRIES IN THE USSR 1959

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FOREWORD

This memorandum is designed to summarize developments in the coal, crude oil, natural gas, and electric power industries in the USSR in 1959. Only passing attention is given to peat, shale, and fuelwood. Soviet trade in coal, coke, crude oil, and petroleum products is examined briefly. Discussion of the development of nuclear energy in the USSR in 1959 has been excluded.

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SIGNIFICANT DEVELOPMENTS IN THE FUELS AND POWER INDUSTRIES IN THE USSR* 1959

Summary and Conclusions

All goals were achieved by the USSR in 1959 for production of primary energy, except for natural gas. There were, however, failures in many of the supporting phases of each of the industries. Significantly the major problems that are anticipated for the energy-producing industries during the remaining years of the Seven Year Plan (1959-65) probably will be more concerned with these supporting activities than with the achievement of production goals.

In 1959 the shift in the energy balance away from coal toward the liquid and gaseous fuels continued. The share of coal in the output of primary energy declined from 57.8 percent in 1958 to 55.2 percent in 1959, as the combined share of crude oil and natural gas increased from 30.1 percent to 32.8 percent.

Production of coal in 1959, 506.5 million tons,** exceeded the plan and was 2.2 percent above the level of production in 1958. Of the increment of approximately 11 million tons in production of coal, 60 percent was provided by coking coal.

A slight improvement in the mechanization of the coal industry was achieved in 1959, but the resultant cost-reducing benefits were more than offset by higher wages resulting from the shift in the coal industry to the shortened work day (6 to 7 hours) and by the low rate of utilization of the equipment park.

The serious shortcomings prevalent in 1959 in all phases of coal processing in the USSR -- cleaning, screening, and briquetting -- reflect an inadequate supply of equipment. The deficiencies in coal processing in 1959 contributed to an accumulation of about 11 million tons of surplus low-quality coal dust and, conversely, to a deficit of 9 million tons in lump coal. The relative importance of peat, shale, and fuelwood in the energy balance of the USSR continued to decline in 1959, although goals for production apparently were met.

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* The estimates and conclusions in this memorandum represent the best judgment of this Office as of 1 July 1960.

** Tonnages are given in metric tons throughout this memorandum.

Little change occurred in 1959 in imports and exports of coal and coke by the USSR. The slight increase in deliveries of coal to the Free World was offset by a comparable decline in deliveries to other Sino-Soviet Bloc* countries.

Production of crude oil in the USSR in 1959 was reported to have reached 129.5 million tons, an increase of 14.4 percent compared with 1958. Production of crude oil in the Urals-Volga Region (Economic Regions VIII and VI**) probably represented 70 percent of the national total. In Azerbaydzhan SSR, the other major area of production of crude oil, the share in the national total declined from 14.6 percent in 1958 to about 13.2 percent in 1959.

For the first time the volume of exploratory drilling exceeded that of exploitation drilling. The shift in emphasis to exploratory drilling reflects the desire of the USSR to establish sufficient proved reserves for future increases in production.

The output of petroleum products from the refining of crude oil increased to 108.5 million tons in 1959, a growth of 13.4 percent compared with 1958. Little change in the percentage yield of individual products was apparent.

All of the increments in refining capacity in the USSR in 1959 are estimated to have taken place at existing refineries. Capacity for primary distillation increased by more than 15 million tons, largely through additions at the Omsk, Novo-Gor'kiy, Fergana, and Perm' refineries.

The quality of Soviet petroleum products continued to decline in 1959. This decline may be attributed to the lack of capacities for catalytic secondary refining and to the high sulfur and paraffin content of the crude oil charged to refining.

Of the 95 million tons of petroleum products available for domestic consumption in the USSR in 1959, 13.9 million tons, or 14.6 percent, were directed to meet military needs. Industry probably accounted for more than 50 percent of the civil consumption of petroleum products, with transport and agriculture consuming most of the remainder.

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* The terms Sino-Soviet Bloc or Bloc as used in this memorandum include the following countries: Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, the USSR, Communist China, North Vietnam, and North Korea.

** As defined and numbered on map 27052 (7-58), USSR: Political-Administrative Divisions and Economic Regions, March 1958.

The Soviet goal for construction of trunk oil pipelines in 1959 was not met, reflecting for the most part a lack of large-diameter steel pipe. Purchase of steel pipe abroad increased sharply, and efforts were made to contract the construction of entire pipeline systems to Western firms. These efforts as yet have not proved successful. Available information points to difficulty in 1959 in the construction of new storage capacity, although success was realized in the use of washed-out salt strata for this purpose.

Net exports of crude oil and petroleum products from the USSR to the Free World in 1959 increased by 51 percent, to 14.2 million tons, and to other countries of the Soviet Bloc, by 60 percent, to 6.4 million tons. Exports of crude oil and petroleum products to the Free World continued to be used to obtain foreign exchange, equipment, and consumer items and as a means of penetration of the economy of the purchasing country.

Of all the forms of primary energy in the USSR in 1959, only the goal for production of natural gas was not met. Production of natural gas, estimated at 35.5 billion cubic meters (cu m),* fell far short of the goal of 39.2 billion cu m. Both an inability to transport and an inability to consume larger quantities of natural gas were largely responsible for this underfulfillment of plan.

Probably the most dramatic achievement of the natural gas industry of the USSR in 1959 was the very sharp increase in proved reserves, to 1,500 billion cu m, an increment of more than 500 billion cu m, which exceeded the plan by almost 50 percent. Almost equally important was the construction of 3,685 kilometers (km) of transmission gas pipeline, approximately equivalent to all gas pipeline construction during 1946-55. The major gas pipeline completed for use in 1959 was the 28-inch 800-km pipeline from Serpukhov to Moscow. Perhaps of more interest, however, was the initial construction on the 40-inch gas pipeline from Krasnodarskiy Kray to Moscow, the largest gas pipeline in the world (in terms of diameter).

Serious concern was shown in November 1959 by Nikita S. Khrushchev over current developments in the electric power industry. This concern centered on the reduced rate of construction of new capacity and the implied threat of power shortages in the immediate future. Khrushchev reaffirmed the priority given to construction of new generating

* Calculations were based on deposits of nonassociated natural gas only and do not take into consideration the reserves of natural gas produced in association with crude oil. Nonassociated natural gas refers to natural gas produced from gas wells. Associated natural gas is natural gas produced at oil wells in association with crude oil.

capacity in thermal electric powerplants as providing the cheapest and most rapid means of achieving additional capacity for generating electric power in the USSR.

The plan for installation of new generating capacity in the USSR in 1959 was underfulfilled by 4 percent, attributed primarily to shortcomings in planning and to the inadequate and untimely delivery of equipment. Nevertheless, through the more intensive use of existing capacity, production of electric power increased in 1959 to 264 billion kilowatt hours (kwh), a growth of about 12 percent compared with 1958 and slightly above the planned rate of growth of 11 percent.

Among the major Soviet accomplishments in 1959 in the electric power industry was the initial operation of the 1,000-km, 500,000-volt transmission line from the Stalingrad hydroelectric plant to Moscow, the highest tension transmission line in the world.

I. Energy Balance of the USSR

Production of primary energy in the USSR in 1959 increased by about 6.9 percent compared with 1958, slightly less than the average annual rate of 7.3 percent needed during the Seven Year Plan (1959-65) to meet the goals for 1965. The trend toward increased proportions of crude oil and natural gas in the energy balance at the expense of coal, which began in 1955, continued in 1959. This emphasis on production of the more economical liquid and gaseous fuels is to continue throughout the Seven Year Plan. Estimated production of primary energy in the USSR in 1955 and in 1958-59 and that planned for 1965 are shown in Table 1.* The share of coal declined from 57.8 percent in 1958 to 55.2 percent in 1959, and, concomitantly, the combined share of crude oil and natural gas increased from 30.1 percent to 32.8 percent.

A special commission within Gosplan, USSR, was established in 1959, to analyze and provide solutions to problems inherent in the creation of a unified fuels and energy balance in the USSR. 1/** Although the influence of this commission was not readily apparent in 1959, it is believed that in the coming years benefits will accrue to the fuels and energy sector of the economy through the unification of planning for production and consumption.

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* Table 1 follows on p. 5.

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Table 1

Estimated Production of Primary Energy in the USSR, by Source of Energy
1955, 1958-59, and 1965 Plan

Source of Energy	1955 a/		1958 a/		1959		1965 Plan	
	Million Metric Tons of Standard Fuel b/	Percent of Total	Million Metric Tons of Standard Fuel b/	Percent of Total	Million Metric Tons of Standard Fuel b/	Percent of Total	Million Metric Tons of Standard Fuel b/	Percent of Total
Coal	310.8	63.2	375.4	57.8	383.5	55.2	439.2	41.3
Crude oil	101.2	20.6	161.9	24.9	185.2	26.6	347.5	32.7
Natural gas	11.4	2.3	33.9	5.2	42.6	6.1	178.0	16.8
Peat	20.8	4.2	21.1	3.2	22.0	3.2	25.7	2.4
Shale	3.3	0.7	4.5	0.7	4.7	0.7	6.0	0.6
Fuelwood	32.4	6.6	32.9	5.1	32.0	4.6	28.6	2.7
Hydroelectric power	11.6	2.4	20.4	3.1	25.0	3.6	34.0	3.2
Nuclear electric power	0	0	Negligible	Negligible	Negligible	Negligible	3.0	0.3
Total	491.5	100.0	650.1	100.0	695.0	100.0	1,062.0	100.0

a. Except for estimates for hydroelectric and nuclear electric power, data are from source 2/.
b. The term standard fuel refers to a measure adopted by Soviet authorities for the purpose of comparing fuels on the basis of their calorific values. Standard fuel has been assigned a calorific value of 7,000 kilocalories per kilogram.

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II. Solid Fuels

A. Coal

Production of coal in the USSR in 1959 increased by 2.2 percent compared with 1958, to 506.5 million tons. 3/ This level of production was approximately 6 million tons above the goal for 1959. Production of coking coal, 100.8 million tons, also exceeded the plan. It is estimated that 60 percent of the increment in production of coal was provided by the increase in production of coking coal. The European USSR* (including the Urals) continued as the dominant source of underground mining of coal and of total output of all means of production. The eastern regions** of the USSR continued to provide the larger share of coal produced by strip-mining.

No significant change took place in 1959 in the percent of total production of coal in the USSR represented by strip-mining. The share of coking coal as a percent of total production of coal increased only slightly, from 19.0 percent in 1958 to 19.9 percent in 1959. The major portion, 67.2 percent, of the coking coal mined in the USSR in 1959 was mined in the European USSR. Estimates of production of coal and coking coal in the USSR in 1955, 1958-59, and that planned for 1965 are shown in Table 2.

Table 2

Estimated Production of Coal and Coking Coal in the USSR
1955, 1958-59, and 1965 Plan

Year	Coal (Million Metric Tons)	Coking Coal	
		Amount (Million Metric Tons)	Percent of Total Coal
1955	391.3	77.4	19.8
1958	495.8	94.4	19.0
1959	506.5	100.8	19.9
1965 Plan	606.0	153.0	25.2

* Unless otherwise indicated, the term European USSR, as used in this memorandum, refers to the geographical area formed by Economic Regions I, II, III, IV, V, VI, and VII. The remaining area is referred to as the eastern regions.

** Excluding Economic Region VIII (Urals).

Mechanization of production of coal is important as a means of reducing costs of production, raising labor productivity, and increasing output. Some success was realized in raising the level of mechanization of the coal industry of the USSR in 1959, particularly in loading operations. 4/ The resultant benefits continue to be offset, however, by a low level of utilization of the coal machinery available. It is estimated that in 1959 less than 53 percent of the available coal combines were actually in use, a reflection of the low level of mechanization in the other phases of coal extraction.

Increased yields of low-quality anthracite coal dust for which there is no market have accompanied mechanization of the mining of coal in the USSR. The quantity of surplus dust amounted to about 11 million tons in 1959. Tests were carried out in 1959 on a new coal combine, the K-26, that, compared with other models, allows a 50-percent reduction in coal dust produced. Serial production of the K-26 combine is planned for 1960.

The current trend in the coal industry of the USSR places more emphasis on raising the quality of coal and less emphasis on increases in production. Processes that serve to improve the quality of coal include cleaning, screening, and briquetting. Serious shortcomings were prevalent in 1959 in all three phases, reflecting for the most part a lack of equipment. In turn, these shortages of equipment led to an increase in the quantities of unprocessed anthracite coal dust and to shortages of sorted anthracite lump coal, the latter reaching about 9 million tons.

Although virtually all types of coal produced in the USSR need cleaning, in 1959 only about 30 percent was processed. In an attempt to relieve the shortage of capacity for cleaning coal, a total of seven cleaning plants was purchased abroad by the USSR in 1959 -- two plants from West Germany and five plants from France. 5/ The lack of cleaning capacity limits the output of coking coal concentrate used in producing coke. Much uncleaned coking coal is consumed in the generation of electric power. The processing of energy coal and coking coal at cleaning plants in the USSR in 1955, 1958-59, and that planned for 1965 is as follows:

Year	Energy Coal Cleaned (Million tons)	Coking Coal Cleaned (Million tons)	Total Coal Cleaned as a Percent of Total Production
1955	32	69	26
1958	50	86	27
1959	54	91	29
1965 Plan	105	157	43

The capacity for screening coal in 1959 was equivalent to only about 19 percent of production, and the amount screened in 1959, 96 million tons, was approximately the same as in 1958. An analysis of plans for increments in the capacity for screening through 1965 indicates an addition of only 13 million tons.

An increase in the capacity for briquetting would serve to reduce the quantities of surplus anthracite dust and would help to alleviate the shortage of lump fuel. Capacity for briquetting in 1959 is estimated at about 4 million tons, including only 500,000 tons of hard coal. Analysis of plans covering the remaining years of the Seven Year Plan does not reveal any desire on the part of the USSR for significant additions to capacity for briquetting. 6/

It is believed that the cost of production of coal increased during 1959 compared with 1958 largely because of the increase in wages that resulted from the shift to the 6 to 7 hour workday throughout the industry. The wage increases more than offset the negligible influence on reduction of costs that might result from an increase in low-cost strip-mining of coal. In addition, the reduction in costs resulting from a slightly higher level of mechanization of operations in 1959 were negated by the low rate of utilization of available equipment. Based on trends in 1959, it is unlikely that the desire to reduce the costs of production of coal 17 percent below the level of 1958 will be realized by 1965.

B. Other Solid Fuels

Other than data that permit derivation of estimates of production of peat, shale, and fuelwood, information is lacking on general developments in these particular industries in the USSR in 1959. As sources of primary energy in the USSR, these fuels declined from 11.5 percent of total primary energy in 1955 to 9.0 percent in 1958 and 8.4 percent in 1959. Estimates of production of peat, shale, and fuelwood in the USSR in 1955 and 1958-59 are shown in Table 3.*

III. Crude Oil and Natural Gas

A. Drilling

In 1959, for the first time, the volume of exploratory drilling for crude oil and natural gas in the USSR exceeded that of exploitation drilling. 7/ The shift in emphasis to exploratory drilling reflects the desire of the USSR to establish sufficient proved reserves for future increases in production of crude oil and natural gas.

* Table 3 follows on p. 9.

Table 3

Estimated Production of Peat, Shale, and Fuelwood
in the USSR
1955 and 1958-59

Year	Peat (Million Metric Tons)	Shale (Million Metric Tons)	Fuelwood (Million Cubic Meters)
1955	50.8	10.8	226
1958	52.8	13.2	220
1959	55.0	13.7	215

Estimated exploratory and exploitation drilling for crude oil and natural gas in the USSR during selected years of the period 1955-65 are shown in Table 4.*

Although specific data are not available with which to measure the growth in proved reserves of crude oil in 1959 -- a reflection for the most part of the success of the exploratory drilling program -- there is evidence of more than minimum achievements. Additions to proved reserves of nonassociated natural gas during 1959 measured more than 500 billion cu m -- 50 percent above the planned goal. This addition to reserves was accomplished in spite of the plan for exploratory drilling for natural gas being underfulfilled by 13 percent. Proved reserves of natural gas at the beginning of 1960 are estimated at about 1,500 billion cu m, an increase of more than 200 percent since 1955.

Of particular interest in 1959 was the construction and initial operation of the first floating drilling platform in the USSR. This platform, similar in construction and purpose to those in use off the Gulf Coast of the US, was designed for drilling 600-meter prospecting wells at depths of 2.5 to 6.5 meters. 8/

B. Production

1. Crude Oil

Production of crude oil in the USSR in 1959 is reported to have reached 129.5 million tons, 9/ an increase of 14.4 percent

* Table 4 follows on p. 10.

Table 4

Estimated Exploratory and Exploitation Drilling
for Crude Oil and Natural Gas in the USSR
1955, 1958-59, and 1960 and 1965 Plans

Thousand Meters

Type of Drilling	1955	1958	1959	1960 Plan	1965 Plan
Exploratory					
Crude oil a/	2,007	2,623	3,109	3,313	6,705
Natural gas	235 b/	746 b/	985 b/	1,295 b/	3,407 c/
Total	2,242 d/	3,369 d/	4,094 e/	4,608 e/	10,112 f/
Exploitation					
Crude oil	2,729 g/	N.A.	3,442 e/	3,516 e/	N.A.
Natural gas	41 g/	N.A.	207 a/	232 a/	N.A.
Total	2,770 d/	3,518 d/	3,649 a/	3,748 a/	6,738 a/
Grand total	5,012 d/	6,887 d/	7,743 e/	8,356 e/	16,850 h/

a. Residual.
b. 10/
c. 11/
d. 12/
e. 13/
f. 14/
g. 15/
h. 16/

compared with 1958. This rate of growth during the first year of the Seven Year Plan is well beyond the average of 11 percent necessary to reach the midpoint of the control figures of 230 million to 240 million tons given in the plan for 1965. The confidence generated by the expansion of capacity to produce crude oil in the USSR in 1959 is reflected in the goal of 144 million tons established for 1960, 17/ which exceeds by 6.7 percent the goal of 135 million tons formulated for 1960 under the abandoned Sixth Five Year Plan (1956-60).

The regional distribution of production of crude oil in 1959 reflects the continuing importance of the Urals-Volga Region. It is believed that production of crude oil in the Urals-Volga Region, commonly known as the Second Baku, accounted for about 70 percent of the national total in 1959. In Azerbaydzhan SSR, the other major area

of production of crude oil, the share in the national total declined from 14.6 percent in 1958 to about 13.2 percent in 1959 in spite of an absolute increment in production of 580,000 tons. 18/ There were no significant changes in production of crude oil in the rest of the USSR.

It should be pointed out that the average productivity per well in the USSR is relatively high. In 1959, for example, the total yield of crude oil was derived from approximately 32,000 wells, for an average of about 81 barrels of crude oil per day for each well. In contrast, average productivity per well in the US in 1959 was about 12 barrels per day, from a total of 589,533 domestic producing wells. 19/

The relatively high average productivity per well in the USSR, in combination with an equally high share of total production provided by free-flowing wells, is reflected in low cost per unit of output. The cost of production of 1 ton of crude oil in the USSR in 1959 is estimated at $7.75,* a decline of more than 25 percent from 1955. 20/ For comparison, the average wellhead price of crude oil in the US in 1959 was about $21.46 per ton. 21/

2. Natural Gas

Production of natural gas in the USSR in 1959, which includes both natural gas from gas wells and natural gas produced in association with crude oil, is estimated at 35.5 billion cu m. Although this level of production represents a growth of about 26.3 percent compared with 1958, the natural gas industry failed by a considerable margin to achieve the goal of 39.2 billion cu m that had been established for 1959. The reasons for this underfulfillment are twofold: (a) a lack of gas-consuming equipment and (b) a lack of large-diameter steel pipe that was needed for expansion of the natural gas transmission system. To avert another failure by the gas industry to meet production goals, Soviet planners have found it necessary to reduce the goal for production of natural gas in 1960 by about 14 percent, to an estimated 51.5 billion cu m, compared with an earlier goal of 60 billion cu m for that year. Estimated production of natural gas in the USSR for selected years of the period 1955-65 is shown in Table 5.**

Production of natural gas in the USSR is centered in a relatively small number of producing fields. Of these, by far the most productive in 1959 were the fields of Stavropol'skiy Kray, which

* Converted at the official rate of exchange of 4 rubles to US $1.
** Table 5 follows on p. 12.

yielded, it is estimated, 8 billion cu m of natural gas, and those of Shebelinka in the Eastern Ukraine, which yielded approximately 7 billion cu m. These two areas together accounted for more than 42 percent of the total natural gas produced in that year.

Table 5

Estimated Production of Natural Gas
in the USSR
1955-60 and 1965 Plan

Billion Cubic Meters

Year	Nonassociated Natural Gas	Associated Natural Gas	Total
1955 a/	5.9	3.1	9.0
1956 a/	8.3	3.8	12.1
1957 a/	14.1	4.5	18.6
1958 a/	22.5	5.6	28.1
1959	28.5	7.0	35.5
1960	42.5	9.0	51.5
1965 Plan a/	132.9	15.4	148.3

a. 22/

3. Natural Gas Liquids

Production of natural gas liquids* in the USSR in 1959 is estimated at about 200,000 tons, 23/ far short of the goal of 550,000 tons, 24/ and probably reflecting for the most part a lag in construction of plants to extract natural gasoline from natural gas.

Development of this phase of the natural gas industry is in the early stages, and, to guide its further expansion, a special trust within the Main Administration of the Gas Industry (Glavgaz) was created in 1959. 25/ Designated as All-Union Gas (Soyuzgaz), this trust was given responsibility for the delivery of liquefied gases to all consumers within the USSR, for construction of storage facilities,

* Those liquid hydrocarbon mixtures which are gaseous in the reservoir but which are recoverable by condensation or absorption. Natural gasoline, condensate, and liquefied petroleum gases fall in this category.

and for initial supervision of the Moscow gas liquefaction plant and the Leningrad liquefied gas regeneration plant.

C. Refining of Crude Oil

The total yield of petroleum products in the USSR in 1959, 108.5 million tons, represented an increase of 13.4 percent compared with 1958. Little change was apparent in the percentage yields of the individual products except for slight declines in the yields of gasoline, kerosine, and light diesel fuel and a growth in the yield of residual fuel oil and other residual products of approximately 5 percent. Estimates of the yields of the principal types of petroleum products in the USSR in 1955, 1958-59, and that planned for 1965 are shown in Table 6.*

Capacities for all types of refinery in the USSR probably were only barely sufficient in 1959. Estimates of the increments in capacity for refining in the USSR in 1959, by type of process, are shown in Table 7.** All of the increments in capacity for refining in 1959 are assumed to have been at existing refineries. Of the total increment of about 15.1 million tons, probably more than 70 percent was installed at four of the five major refineries commissioned during 1955-58, as follows:

	Thousand Tons of Capacity	
Refinery	1958	1959
Omsk	7,930	12,000
Novo-Gor'kiy	1,030	3,200
Fergana	650	2,600
Perm'	130	2,600

Of particular significance in 1959 was the sharp increase in capacity for both catalytic reforming and catalytic hydrotreating, although these capacities as yet lag considerably behind the minimum desired. It is not known at what sites these expansions took place.

There has been a general deterioration in the quality of petroleum products in the USSR. This deterioration may be attributed to the lack of capacities for secondary catalytic refining and to the high

* Table 6 follows on p. 14.
** Table 7 follows on p. 15.

Table 6

Estimated Production of Petroleum Products in the USSR, by Type of Product
1955, 1958-59, and 1965 Plan

Product	1955		1958		1959		1965 Plan	
	Million Metric Tons	Percent of Total a/	Million Metric Tons	Percent of Total a/	Million Metric Tons	Percent of Total a/	Million Metric Tons	Percent of Total a/
Gasoline	15.7	22.9	21.5	20.7	23.7	20.1	35.4	16.5
Ligroine	0.4	0.6	0	0	0	0	0	0
Kerosine	10.9	15.9	13.2	12.7	14.7	12.5	24.0	11.2
Light diesel fuel	9.3	13.6	21.5	20.6	23.4	19.8	31.8	14.9
Total light products	36.3	53.0	56.2	54.0	61.8	52.4	91.2	42.6
Heavy diesel fuel	1.6	2.3	3.2	3.1	4.0	3.4	11.2	5.2
Total distillates	37.9	55.3	59.4	57.1	65.8	55.8	102.4	47.8
Lubricants	2.7	4.0	4.6	4.4	5.1	4.3	7.9	3.7
Residuals and others b/	22.3	32.7	31.7	30.5	37.6	31.9	86.7	40.5
Total output of petroleum products	62.9	92.0	95.7	92.0	108.5	92.0	197.0	92.0
Gas and loss	5.5	8.0	8.3	8.0	9.4	8.0	17.1	8.0
Grand total	68.4	100.0	104.0	100.0	117.9	100.0	214.1	100.0

a. Percentages are derived from unrounded data.
b. Residual fuel oil, road oils, asphalts, bitumen, and bituminous tar.

content of sulfur and paraffin in the crude oil charged to refining. To improve the quality, the USSR must increase the capacities of processes such as cracking, reforming, and hydrotreating. As shown in Table 7, high rates of growth were achieved in 1959 in increments in capacity for each of these processes. Annual capacity, however, still is considered insufficient.

Table 7

Estimated Increments in Refining Capacity in the USSR, by Type of Process 1959

Type of Process	Refining Capacity (Million Metric Tons) 1958	1959	1959 Increment Million Metric Tons	Percent
Primary distillation	122.3	137.4	15.1	12.3
Secondary processes				
Thermal conversion	24.5	27.5	3.0	12.2
Catalytic cracking	12.0	16.3	4.3	35.8
Catalytic reforming	1.0	2.9	1.9	190.0
Catalytic hydrotreating	1.0	5.9	4.9	490.0
Lubricant processing	5.4	6.2	0.8	14.8

D. Disposition of Petroleum Products and Natural Gas

It is estimated that of the 95 million tons of petroleum products available* for distribution among the various consumers in the USSR in 1959, 13.9 million tons (14.6 percent) were allocated to meet military needs.** The remaining 81.1 million tons (85.4 percent) were allocated to the civil economy. Estimates of the supply and demand for petroleum products in the USSR in 1959 are shown in Table 8.***

* Total supply less exports, losses, and increments in storage.

** Including consumption of petroleum products by Soviet civil aviation.

*** Table 8 follows on p. 17.

The distribution of the 81.1 million tons to the civil economy in 1959 may be established roughly as follows:

Consumer	Million Tons	Percent of Total
Transport	16.2	20.0
Agriculture	19.0	23.4
Household and communal	3.2	3.9
Industry	42.7	52.7
Total	81.1	100.0

An increasing disproportion between production and consumption of automobile gasoline and diesel fuel was evident in the USSR in 1959. Increased demands for diesel fuel as a result of the continued dieselization of the agricultural and transport sectors of the economy exceeded the capability of the USSR to produce this fuel. Conversely the increase in production of automobile gasoline exceeded the growth in consumption of automobile gasoline by the national economy. This situation has existed in the USSR for some time, but the gravity of the problem facing the refining industry had not been discussed in the Soviet press until recently. Included among numerous measures being considered to overcome these disproportions are (1) the use by diesel engines of a mixture of automobile gasoline and diesel fuel, (2) the use of a portion of the automobile gasoline as a diesel fuel, (3) production of diesel fuel at below-standard specifications, and (4) a reduction in the yield of gasoline accompanied by an increase in the yield of diesel fuel. 26/ The latter would afford the USSR the preferable approach but would involve additional capital investment for the construction of new refining equipment.

A larger share of the annual production of natural gas in the USSR continues to be used by industry. The share of industry in the annual consumption of natural gas is to be increased from 74 percent in 1956 to more than 90 percent in 1965. According to preliminary information, the distribution of consumption of natural gas in 1959 supported this trend, and it is estimated that the share of industry represented about 85 to 86 percent of the total in that year. Thus, although the amounts of natural gas made available to the public for cooking and heating continue to increase, the percentage share of this sector in the national total continues to decline.

The leading consumers of natural gas in the USSR are electric powerplants, which in 1959 probably accounted for more than 37 percent of the total natural gas consumed. Other major consumers are the cement and heavy metallurgical industries.

Table 8

Estimated Balance of Supply and Demand
for Petroleum Products
in the USSR
1959

Million Metric Tons

	Amount
Supply	
Production	108.5 a/
Imports	2.0
Total	110.5
Demand	
Military	13.9
Civil	81.1
Exports	11.4
Losses and increments in storage	4.1 b/
Total	110.5

a. From Table 6, p. 14, above.
b. Losses were estimated at about 3 percent of the total availability. Increments in storage are from source 27/.

E. Distribution and Storage of Crude Oil and Petroleum Products

The cheapest way to transport crude oil and petroleum products in the USSR is by trunk pipeline. The average cost of transporting crude oil and products by pipeline in 1959 was reported at 11.8 rubles ($2.95) per thousand ton-kilometers, compared with 16 to 17 rubles ($4.00 to $4.25) by water and 32.6 rubles ($8.15) by railroad. 28/ Yet the development of the trunk oil pipeline system has lagged behind the general expansion of the crude oil industry as a whole, and most of the crude oil and products has been moved by the railroads. Although more than 80 percent of the crude oil is delivered to refineries by pipeline, less than 20 percent of the light petroleum products are moved to consumers by pipeline. 29/

Estimated construction of oil pipelines in the USSR for selected years during the period 1951-65 is shown in Table 9. Failures to achieve planned construction have occurred yearly since 1950, underlining for the most part the lack of large-diameter steel pipe. Because of this lack of pipe, the USSR has increased its purchases of pipe from the Free World, particularly Western Europe. Perhaps of more importance, however, the USSR has sought contracts for construction of entire pipeline systems from Western firms. The latter efforts have not as yet proved completely successful.

Table 9

Estimated Construction of Trunk Oil Pipelines
in the USSR
Selected Years, 1951-65

Thousand Kilometers

Period	Length Installed	Total Availability
1951-55	5.4	10.4 a/
1956	1.2	11.6 b/
1957	1.6	13.2 a/
1958	1.2	14.4 a/
1959	1.9	16.3 c/
1960 d/	2.0	18.3 c/
1965	N.A.	35.4 e/

a. 30/
b. 31/
c. 32/
d. Plan data.
e. 33/

As shown in Table 9, 1,900 km of trunk pipelines for crude oil and petroleum products were completed for use in 1959. Most important of those pipelines completed were the extension of the Tuymazy-Omsk crude oil pipeline No. 2 to Sokur, about 175 km east of Novosibirsk; the completion of a product pipeline linking Omsk with Novosibirsk and Sokur; and the extension of the Kuybyshev-Syzran' product pipeline to Penza. Available information does not indicate construction on either the oil pipeline to Klaypeda or the pipeline to the European Satellites in 1959. The availability of trunk oil pipelines in the USSR at the end of 1959 is estimated at 16,300 km.

Considerable difficulty was encountered in the construction of new storage capacity, particularly of those reservoirs for which reinforced concrete was to be used. Experiments in Bashkirskaya ASSR in the use of washed-out salt strata for the underground storage of crude oil and petroleum products proved reliable, 34/ and it is probable that some commercial use of such facilities will be made in the next few years.

The Main Administration for Petroleum Sales (Glavneftesbyt) was dissolved at the beginning of 1959 and replaced by the All-Union Main Administration for Interrepublic Delivery of Petroleum Products (Soyuzglavneft'), attached to Gosplan, USSR. 35/ The new main administration was given the responsibility for establishing plans for interrepublic delivery of petroleum products -- including those quantities designated for export, for the government reserve, and for ministries and departments of the USSR. This new organization also was to have control over the fulfillment of plans for these deliveries by the petroleum marketing organs of the union republics. At the same time, both the entire network of trunk oil pipelines and the bases for transfer and distribution of oil were given to the Council of Ministers of each of the union republics.

F. Distribution and Storage of Natural Gas

Except for small quantities of liquefied gas transported by railroad tank car or in cylinders by trunks and barges, the only form of transport used by the natural gas industry is the transmission gas pipeline. The length of the transmission gas pipeline system in the USSR at the beginning of 1960 was 17,000 km, of which 3,685 km were installed in 1959. 36/ Construction of gas pipeline in 1959 was approximately equal to all construction of gas pipeline during 1946-55.

Four major transmission gas pipelines -- an 800-km pipeline from Serpukhov to Leningrad, a 550-km pipeline from Shebelinka to Bryansk, a 420-km pipeline from Stavropol' to Groznyy, and a 500-km pipeline from Karadag to Tbilisi -- were completed for use in 1959.

In addition to these major projects, and perhaps of more interest with respect to an appraisal of Soviet capabilities in the installation of long-distance pipeline, was initial construction on the 40-inch gas pipeline that is to deliver natural gas from the deposits in Krasnodarskiy Kray to consumers in Moscow and Leningrad. Repeatedly delayed because of a lack of pipe, construction was begun in August 1959 using pipe purchased from West Germany. Apparently enough pipe was purchased to give the USSR time to expand internal capacity for production of 40-inch steel pipe.

Transmission gas pipelines carried 20.1 billion cu m of natural gas in 1959, equivalent to about 90 percent of the annual plan. 37/ This underfulfillment, caused by a lack of equipment and deficiencies in planning, may be attributed to failure to achieve planned construction of compressor stations.

IV. Electric Power

Production of electric power in the USSR in 1959 reached 264 billion kwh, exceeding the plan by more than 2 percent and representing a growth in production of about 12 percent compared with 1958. 38/ This percentage increase is approximately equivalent to the average annual rate of growth required to achieve the Seven Year Plan goal of 520 billion kwh in 1965. Estimates of production of electric power by thermal electric and hydroelectric powerplants in the USSR in 1955 and 1958-59 and that planned for 1965 are shown in Table 10.

Table 10

Estimated Production of Electric Power
by Thermal Electric and Hydroelectric Powerplants
in the USSR
1955, 1958-59, and 1965 Plan

Million Kilowatt Hours

Type of Powerplant	1955	1958	1959	1965 Plan
Thermal electric	147,060	188,913	216,400	428,400
Hydroelectric	23,165	46,487	47,600	91,600
Total	170,225	235,400	264,000	520,000

In spite of the above-plan growth in production, the accomplishments of the electric power industry of the USSR during 1959 were admitted to be unsatisfactory. Most of the dissatisfaction was the result of failure to fulfill the plan for installation of new generating capacity. Actual installation reached about 5.5 million kilowatts (kw), 39/ compared with the planned 5.7 million kw. 40/ Moreover, failure to fulfill the plan would have been considerably greater had not the installation of new hydroelectric capacity exceeded the plan by about 600,000 kw. Installation of new capacity at hydroelectric powerplants in 1959 is estimated to have been about 1.9 million kw, or 35 percent of the total capacity installed during

the year. Thus it may be calculated that installation of new thermal capacity was below that planned by 800,000 kw, or the equivalent of 20 percent of the 1959 plan. The planned installation of five new hydroelectric powerplants was carried out in 1959, but of the six new thermal electric powerplants planned for installation, it is estimated that only four had gone into operation by the end of the year.

The failure to meet the plan for installation of new thermal capacity in 1959 was, in essence, a continuation of difficulties encountered in 1958, when the total plan for installation of new electric power capacity was underfulfilled by more than 600,000 kw and that for construction of thermal electric powerplants was underfulfilled by 800,000 kw. 41/ The reasons for failure to meet construction plans are multiple, but among the more important were too much emphasis on completion in the last quarter of the year,* inadequate and untimely deliveries of equipment, and a lack of new designs for equipment. Only through the more intensive use of existing capacity was the USSR able to meet the 1959 plan for generation of electric power. Average use of existing capacity increased from 4,864 hours in 1958 to 4,947 hours in 1959.

Estimates of the capacity of electric powerplants for 1955 and 1958-59 and that planned for 1965 are as follows:

Year	Capacity (Thousand Kilowatts)		Total Capacity Increase Above Previous Year (Percent)
	Hydroelectric Powerplants	Total	
1955	5,996	37,246	13.5
1958	10,856	53,367	10.3
1959	12,779	58,867	10.3
1965 Plan	21,800	112,000	11.2**

In addition to the failure to achieve planned construction of new generating capacity, considerable difficulty was encountered in installing new transmission lines, primarily because of shortages of

* It was reported that 65 percent of the additions to capacity in 1959 were to have been installed in the last quarter. 42/

** Average annual rate of increase needed during the Seven Year Plan to meet the 1965 goal.

cable. Of the 14,500 km of new transmission line planned for installation in 1959, 10,000 km remained for completion in the last quarter. 43/ Yet one of the major accomplishments of the electric power industry during 1959 was the completion and initial operation of the 1,000-km, 500,000-volt alternating current transmission line from the Stalingrad hydroelectric plant to Moscow -- the highest tension transmission line in the world. 44/ Nevertheless, because total installation of transmission lines in 1958 reached only 6,000 km and was below plan, 45/ it is unlikely that the 1959 plan for installation of transmission lines was met.

In 1959 the planning organizations of the Ministry for Construction of Electric Powerplants developed new techniques designed to reduce both costs and time of construction. Construction methods were modernized and technically improved, and requirements for materials established for previously designed projects were examined for excesses. Much greater use will be made of prefabricated concrete components, a Soviet innovation designed to yield savings in time and money.

The greater portion of total net electric power generated in the USSR continues to be directed to meet the needs of industry. It is estimated that in 1959 about 64 percent of the total electric power generated was consumed by industry. Estimated total allocation of electric power in the USSR in 1959 and that planned for 1965 are shown in Table 11.*

Khrushchev, in November of 1959, showed real concern over the present tempo of development of electrification, which not only threatens achievement of the goals for 1965 but also threatens power shortages in the immediate future. He reasserted the priority of construction of thermal electric rather than hydroelectric powerplants as the more rapid and less costly means for increasing electric power generating capacity in the USSR. The success of the 1960 program for construction in the electric power industry may well provide the key for determining whether or not the USSR will be able to achieve the 1965 goals for production of electric power.

V. Trade

A. Crude Oil and Petroleum Products

In 1959, net exports of crude oil and petroleum products from the USSR to the Free World increased by 51 percent, and net exports from the USSR to other countries of the Sino-Soviet Bloc increased by

* Table 11 follows on p. 23.

Table 11

Estimated Total Allocation of Electric Power in the USSR
1959 and 1965 Plan

Allocation	1959		1965 Plan	
	Amount (Billion Kilowatt-Hours)	Percent of Total	Amount (Billion Kilowatt-Hours)	Percent of Total
Industry	170	64.4	335	64.4
Nonindustry	62	23.5	122	23.5
Total consumption	232	87.9	457	87.9
Losses and consumption by powerplants	32	12.1	63	12.1
Total net electric power generated	264	100.0	520	100.0

60 percent. Exports of crude oil and petroleum products to the Free World from the USSR in 1959 represented about 80 percent of such shipments by all countries of the Bloc. It is estimated that of the 14.2 million tons shipped by the USSR to the Free World, 6.7 million tons were crude oil and 7.5 million tons were petroleum products. Estimates of Soviet trade in crude oil and petroleum products, with the Free World and other countries of the Bloc, during the period 1956-59 are summarized in Table 12.

Table 12

Estimated Trade in Crude Oil and Petroleum Products
by the USSR, by Destination
1956-59

Million Metric Tons

Destination	1956 a/	1957 a/	1958 a/	1959
With the Free World				
Imports	0	0	0	0
Exports	4.3	6.4	9.4	14.2
Net	4.3	6.4	9.4	14.2
With the Sino-Soviet Bloc				
Imports	3.4	2.4	2.3	2.0
Exports	3.0	5.0	6.3	8.4
Net	-0.4 b/	2.6	4.0	6.4
Net total trade	3.9	9.0	13.4	20.6

a. 46/
b. Net imports are designated by the use of a minus sign.

Exports of crude oil and petroleum products to the Free World from the USSR in 1959 may be accepted as an extension of a threefold policy, as follows: (1) the use of crude oil and petroleum products as barter in exchange for equipment and consumer items, (2) the procurement of foreign exchange, and (3) the means of penetrating the economy of the purchasing country.

Such exports to the other countries of the Sino-Soviet Bloc in 1959 underline the increasing dependence of these countries on the USSR as a source for crude oil and petroleum products. Increasing energy deficits, particularly in the European Satellites, during the remaining years of the Seven Year Plan are likely to call for a continuation of imports of larger quantities of crude oil and petroleum products from the USSR.

B. Coal and Coke*

Little change occurred in 1959 in Soviet trade of coal and coke. Exports of coal from the USSR to the Free World increased by about 750,000 tons but were offset by an approximately comparable decline in Soviet deliveries to the European Satellites. Imports of coal into the USSR in 1959 remained at the levels of 1958. Exports of coke to the Free World in 1959 declined by more than one-third, and exports to other countries of the Sino-Soviet Bloc remained unchanged. Estimates of Soviet trade in coal and coke with the Free World and other countries of the Bloc during the years 1955 and 1958-59 are summarized in Table 13.**

* The USSR does not participate in international trade in solid fuels other than coal and coke.

** Table 13 follows on p. 26.

Table 13

Estimated Trade in Coal and Coke by the USSR
by Destination a/
1955 and 1958-59

Million Metric Tons

Destination	1955		1958		1959	
	Coal	Coke	Coal	Coke	Coal	Coke
With the Free World						
Imports	0	0	0	0	0	0
Exports	1.8	0.2	3.6	0.4	4.3	0.3
Net	1.8	0.2	3.6	0.4	4.3	0.3
With the Sino-Soviet Bloc						
Imports	6.6	0	0.3	0	0.3	0
Exports	0.2	1.0	2.8	1.3	1.9	1.3
Net b/	-6.3	1.0	2.6	1.3	1.6	1.3
With others						
Imports	0	0	0.06	0	0.1	0
Exports	0.2	0	0.02	0	Negligible	0
Net b/	0.2	0	-0.04	0	-0.1	0
Net total trade b/	-4.3	1.2	6.1	1.7	5.9	1.6

a. Basic studies used in the construction of this table are those listed in source 47/.
b. Derived from unrounded data. Net imports are designated by the use of a minus sign.

APPENDIX

SOURCE REFERENCES

Evaluations following the classification code and designated "Eval." have the following significance:

Source of Information	Information
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this memorandum. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

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